ADVANCED MACHINING TOWARDS IMPROVED MACHINABILITY OF DIFFICULT-TO-CUT MATERIALS

Edited by:
A.K.M. Nurul Amin (Chief Editor)
Dr. Erry Yulian Triblas Adesta
Dr. Mohammad Yeakub Ali

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

ADVANCED MACHINING

TOWARDS IMPROVED MACHINABILITY OF DIFFICULT-TO-CUT MATERIALS

Edited by:
A.K.M. Nurul Amin (Chief Editor)
Dr. Erry Yulian Triblas Adesta
Dr. Mohammad Yeakub Ali

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Advanced Machining Towards Improved Machinability of Difficult-To-Cut Materials: A.K.M. Nurul Amin, Erry Yulian Triblas Adesta & Mohammad Yeakub Ali

ISBN: 978-967-418-175-8

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

Chapter 15

A coupled Artificial Neural Network and RSM model for the prediction of Chip Serration Frequency in end milling of Inconel 718

Md. Anayet U Patwari[1], A.K.M. Nurul Amin[1*], H. Ishtiyaq[1]
[1]Department of Manufacturing and Materials Engineering
Faculty of Engineering, International Islamic University Malaysia
Kuala Lumpur, Malaysia

[*] Corresponding author e-mail: *akamin@iium.edu.my*

1.0 INTRODUCTION

Serious vibrations are often encountered due to chip segmentation that limits material removal rates. Different types of chips are formed during machining. The nature of chip formation process is extremely complicated. Chip formation process has a discrete nature, associated with the periodic shearing process of the chip during machining of Inconel 718. The instabilities of chip formation process are expressed in terms of primary or secondary serrated frequency. In order to increase productivity, tool life and chatter suppression in the machining of Inconel 718, it is necessary to study the chip segmentation phenomena and its influencing factors.

Chips are formed during the machining of work-pieces. The side of the chip in contact with the cutting tool is normally shiny, flat and smooth while the other side, which is the free work-piece surface, is jagged due to shear. It is important to study the formation of chips during the machining process as the former affects the surface finish, cutting forces, temperature, tool life, dimensional tolerance and chatter. Understanding the chip formation during the machining process for the specific materials will allow us to determine the machining speeds, feed rates and depth of cuts for efficient machining and increased tool life in the specific actual machining operation as well as chatter free machining. In metal cutting, the present tendency is towards achieving increased material removal rates with very reliable machining processes, where the predictability of surface finish, work-piece accuracy, chatter and tool life are of prime importance. But to maintain stable machining, much attention must also be paid to the formation of the desired type of chip and chip controls to facilitate its easy removal. One of the restrictions limiting large material removal rates is the tendency of the machine tool to chatter. Trent, Talantov, Amin and others [1-3] considered the formation of chips with serrated teeth to be the primary cause of chatter. They found that chatter arising during turning is a result of resonance, caused by mutual interaction of the vibrations due to serrated elements of the chip and the natural vibrations of the system components, e.g. the spindle and the tool holder [2-3]. Komanduri [4-5] has made some remarkable progress in the research of chip segmentation and instability in chip formation. Nevertheless it appears that very few works have been done to investigate the nature of chip formation in end milling